Homework Set # 3 − Math 435 − Summer 2013

1. Solve the wave equation $u_{tt} = c^2 u_{xx}$ on the whole real line with $u(x,0) = e^x$ and $u_t(x,0) = \sin(x)$.

2. Classify the PDE and then solve $u_{xx} - 3u_{xt} - 4u_{tt} = 0$, with $u(x,0) = \phi(x)$ and $u_t(x,0) = \psi(x)$. (Hint: Factor the operator as we did for the wave equation as proceed similarly)

3. The damped wave equation is given by

$$u_{tt} - c^2 u_{xx} + ru_t = 0$$

   Follow the basic outline of the proof of conservation of energy we did in class for the wave equation to show that for this equation, the total energy decreases over time (assume $r > 0$).

4. Strauss 2.3, problem 4ac

5. Struass 2.3, problem 5

6. Strauss 2.3, problem 6

7. Strauss 2.4, problem 2

8. Strauss 2.4, problem 3

9. Strauss 2.4, problem 16

10. Strauss 2.4, problem 18